

the *Asteriæ* as formed of the union of numerous individuals attached around a common mouth. In a notice on some points of the organization of the *Euryales* (Mém. de la Soc. des Sc. Nat. de Neuchâtel, tom. ii.), I have given circumstantial details of the structure and disposition of the solid parts of these animals, and have described comparatively two new species.

Messrs. Sars and Forbes have reviewed what Otto Fr. Müller has said respecting the *Pedicellariæ* of the *Echino-dermata*, and have added some new observations upon these singular bodies (Hist. of Brit. Starf., p. 155).

[To be continued.]

XXIV.—*On the Natural Arrangement of Fishes.* By W. S. MACLEAY, Esq., A.M., F.L.S., in a Letter to J. M'Clelland, Esq., dated Elizabeth Bay, near Sidney, N. S. W., September 12th, 1840*.

MY DEAR SIR,

I CANNOT find terms to express my gratitude for your kind letter of the 12th March last, and for the very valuable present which it accompanied. I assure you, that your excellent work on *Cyprinidæ* has afforded me the greatest delight, and the more so, inasmuch as I am convinced natural arrangement is always best tested by accurate analysis, and also inasmuch as I am not by any means satisfied with Swainson's arrangement of Fishes. As from everything Swainson writes there is information to be derived, so I assure you, his little volume on Reptiles and Fishes has not been lost on me; yet the perusal of your Monograph on Indian *Cyprinidæ*† has made me recur to my old views on a subject which our common friend Dr. Cantor may have told you has long occupied my thought; and although perhaps you will deem these views not sufficiently worked out, and rather crude, I cannot refrain from making you acquainted with them, in order that I may have the benefit of comparing your general arrangement of Fishes with my own.

Fishes form a class of Vertebrata which has never yet been satisfactorily divided into orders. I do not think that *Acanthopterygii* and *Malacopterygii*, for instance, are natural orders. In order therefore to arrive at the first great and natural division of Fishes, I think we must commence by incontestable data, or at least by facts that are generally agreed on. Such facts, for instance, I hold to be the three following, viz. 1. The near approach of fishes to Batrachian Amphibia, which with Swainson I consider to be made by means of *Lophius* and *Malthe*. 2ndly. The near approach of fishes to Cetaceous Mammalia, which with him also I consider to take place by means of *Selache* and the viviparous Sharks. 3rdly. As the grand character of fishes as a class is, their being the most imperfect of Vertebrata,

* From the Calcutta Journal of Nat. Hist. for July 1841.

† See Ann. and Mag. Nat. Hist., vol. viii. p. 35.

the most typical of fishes ought therefore to be the most imperfect of them, *i. e.* the furthest removed from the type of Vertebrata. Such fishes are evidently the *Cyclostomi* of Cuvier, such as *Myxine*, and other genera leading off to *Annulosa*. Though essentially aberrant, as they relate to vertebrated animals, the Cyclostomous fishes are typical as respects the circle of fishes. Now it is this circle of fishes in which we have the above three data, namely, the two aberrant orders and one typical order : consequently I arrange the class as follows, into orders :—

ABERRANT GROUP.

CTENOBRANCHII. Gills pectinated.

1. PLAGIOSTOMI, *Cuv.* Cartilaginous fish with fixt branchiæ, leading to *Mammalia*.
2. STURIONES, *Cuv.* Cartilaginous fish with free branchiæ.
3. OSTINOPTERYGII, *MacL.* Bony fish with free branchiæ, leading to *Amphibia*.

NORMAL GROUP.

ACTENOBRANCHII. Fish breathing by gills not pectinated.

4. LOPHOBRANCHII, *Cuv.* Bony fish breathing by tufts arranged in pairs along the branchial arches.
5. CYCLOSTOMI, *Cuv.* Cartilaginous fish breathing by a series of cells.

Now this arrangement differs from that of Swainson, in making the vast majority of fishes an aberrant group ; but it is the structure, not the number of species it contains, that determines the place of a group in nature. The group *Ungulata* is just as important now, when containing comparatively few genera, as it was in the antediluvian ages, when it contained an immense number of them. Besides, I will venture to say, that the above circular arrangement of fishes expresses their place among Vertebrata better than that of Swainson. I shall differ from him still further as I go on. But in the mean time I must observe, that the above and following new names are merely used in order that you may the better understand my meaning. I have been obliged to invent a technical name for bony fishes with pectinated gills, viz.

OSTINOPTERYGII,

which may thus be divided into tribes :—

ABERRANT GROUP.

ACANTHOPTERYGII, *Artedi.* Spines in first dorsal hard.—*Quere.* Are all these Ctenodians of Agassiz?

1. BALISTINA. Plectognathi, *Cuv.* Maxillary bones soldered to the intermaxillaries, and both to the palatine arch. Opercula and gills concealed under the skin.
2. PERCINA. Bones of the jaws free and complete. Operculum distinct. Operculum or preoperculum generally with dentated edges, or with spines.
3. FISTULARINA. Bones of the jaws free and complete. Operculum distinct. Operculum and preoperculum generally with smooth edges.

NORMAL GROUP.

MALACOPTERYGII, Artedi. Spines in dorsals soft.—*Quere.* Are all these Cycloidians of Agassiz?

- 4. PLEURONECTINA. Ventral fins, when existing, inserted under the pectorals, and directly suspended to the bones of the shoulder.
- 5. CLUPEINA. Abdominales, *Cuv.* Ventrals suspended behind the pectorals, and not attached to the bones of the shoulders.

Obs.—The *Balistina*, by the confluence of the bones of their jaw, and by the tardy induration of their skeleton, evidently lead off to the Sturgeons, with which they agree in having their free branchiæ opening by a perforation in the skin behind the temple. The *Fistularina* evidently lead off to the *Lophobranchii* by *Fistularia*. Unfortunately I have not been able to find a near character to separate *Fistularina* from *Percina*; but they are natural groups, because each forms a circle. The following groups appear to be nearly those into which the above tribes may be naturally divided:—

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|----------------------------|------------------|-----------------|
| 1. BALISTINA. | 2. PERCINA. | 3. FISTULARINA. |
| 1. Balistidæ? | 1. Chætodontidæ. | 1. Scombridæ. |
| 2. Ostraciontidæ? | 2. Percidæ. | 2. Fistularidæ. |
| 3. Cephalaspis? <i>Ag.</i> | 3. Scorpenidæ. | 3. Gobioidæ. |
| 4. Orthogoriscidæ? | 4. Cirrhitidæ. | 4. Lophiidæ. |
| 5. Diodontidæ? | 5. Sparidæ. | 5. Labridæ. |
| 4. PLEURONECTINA. | 5. CLUPEINA. | |
| 1. Anguillidæ. | 1. Siluridæ. | |
| 2. Echeneidæ. | 2. Cyprinidæ. | |
| 3. Cyclopteridæ. | 3. Esocidæ. | |
| 4. Pleuronectidæ. | 4. Clupeidæ. | |
| 5. Gadidæ. | 5. Salmonidæ. | |

Obs.—I do not believe the above places of the families of *Balistina* to be correct: besides I only know four. I shall say little therefore respecting them, except that I suspect some undiscovered family of BALISTINA leads off to the genus *Monocentris*, among the *Scorpenidæ*. I shall begin therefore with the true PERCINA and the family *Scorpenidæ*. The following are the probable genera of *Scorpenidæ*, which family agrees with the group called *Buccæ Loricatæ* by Cuvier; but it is rather a stirps than a family, and the following genera ought to be deemed of the rank of families:—

ABERRANT GROUP.

Head either tuberculous or spinous.

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|------------------------------|--------------------------------------|
| 1. MONOCENTRIS, <i>Linn.</i> | Free spines in lieu of first dorsal. |
| 2. TRIGLA, <i>Linn.</i> | Two distinct dorsal fins. |
| 3. SCORPENA, <i>Linn.</i> | Two dorsals more or less confluent. |

NORMAL GROUP.

Head neither tuberculous nor spinous.

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|-------------------------------|---|
| 4. ORCOSOMA, <i>Cuv.</i> | Ventrals complete. Free cones in lieu of first dorsal. |
| 5. GASTEROSTEUS, <i>Linn.</i> | Ventrals reduced to a spine or spines. Free spines in lieu of first dorsal. |

For subgenera, I must always refer to Cuvier and Valenciennes.

From *Scorpena* we proceed by means of the subgenera *Sebastes* among the *Percidæ*, which is a family that I distinguish by having seven branchiostegal rays, no mailed cheeks, no scales on the fins, and always teeth on the palate.

Probable genera of *Percidæ*.

ABERRANT GROUP.

Two dorsals distinct.

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|---------------------------|---|
| 1. PERCA, <i>Linn.</i> | Dorsal fins near. Teeth all small, preoperculum not dentated. |
| 2. OPOGON, <i>Lacep.</i> | Dorsals separate, some of the teeth long. |
| 3. ENOPLOSUS, <i>Cuv.</i> | Dorsal fins near. Preoperculum dentated. |

TYPICAL GROUP.

Two dorsals confluent into one.

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|--------------------------|---|
| 4. SERRANUS, <i>Cuv.</i> | Teeth hooked. Preoperculum dentated. |
| 5. OCEVINA, <i>Cuv.</i> | Teeth small, not hooked. Preoperculum not dentated. |

From *Enoplosus* we proceed to *Ephippus* among the *Chatodontidæ*, or *SQUAMIPENNES* of Cuvier, of which the following are probably the genera :—

ABERRANT GROUP.

No teeth on the palatines.

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|---------------------------|---|
| 1. EPHIPPUS, <i>Cuv.</i> | Dorsal emarginate, so as to show it to be composed by the confluence of two. Ventrals distinct. |
| 2. PSETTUS, <i>Comm.</i> | Dorsal not emarginate. Ventrals evanescent. |
| 3. CHATODON, <i>Linn.</i> | Dorsal not emarginate. Ventrals conspicuous. |

NORMAL GROUP.

Teeth on the palatines.

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|---------------------------|---|
| 4. TOXOTES, <i>Cuv.</i> | Dorsal long, opposite to the anal, and reaching close to the caudal. |
| 5. PEMPHERIS, <i>Cuv.</i> | Dorsal short, opposite to the ventral, and far separated from the caudal. |

From *Chatodon* we proceed to *Amphiprion* among the *Sparidæ*, which differ from the *Chatodontidæ* by having no scales on the fins, and from the *Percidæ* by having no teeth on the palatines. The following may be the natural arrangement of *Sparidæ* into genera :—

ABERRANT GROUP.

SCIÆNOIDES, *Cuv.* Operculum with spines. Preoperculum dentated.

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| 1. AMPHIPRION, <i>Bl.</i> | One dorsal. Branchial rays less than seven. |
| 2. PRISTIPOMA, <i>Cuv.</i> | One dorsal. Seven branchial rays. |
| 3. SCIÆNA, <i>Linn.</i> | Two dorsals distinct. Seven branchial rays. |

TYPICAL GROUP.

No spines on the operculum, and the preoperculum not dentated.

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|-------------------------|--------------------------------|--------------------------|
| 4. MÆNA, <i>Cuv.</i> | <i>Mænides</i> , <i>Cuv.</i> | Upper jaw extensile. |
| 5. SPARUS, <i>Linn.</i> | <i>Sparoides</i> , <i>Cuv.</i> | Upper jaw not extensile. |

By means of *Polynemus* we pass from *Sciæna* to the *Cirrhitidæ*, which differ from the *Percidæ* in having in general either more or less than seven branchial rays, and from the *Sparidæ* in having teeth generally on the palatines. The *Cirrhitidæ*, however, differ from each other very much in form, as may be seen by the following genera, which are clearly of the rank of families :—

Two dorsals.

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|----------------------------|--|
| 1. POLYNEMUS, <i>Linn.</i> | Two dorsals distinct. Ventrals sub-abdominal. |
| 2. MULLUS, <i>Linn.</i> | Two dorsals distinct. Ventrals sub-pectoral. Branchial rays less than seven. |
| 3. TRACHINUS, <i>Linn.</i> | Two dorsals united. Ventrals sub-jugular. Branchial rays more than seven. |

One dorsal, ventral fins subpectoral.

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|-----------------------------|---------------------------------|
| 4. BERYX, <i>Cuv.</i> | Branchial rays more than seven. |
| 5. CIRRHITES, <i>Conem.</i> | Branchial rays less than seven. |

By means of *Trachinus* we return among the *Scorpenidæ*, from which we set out, so that the circle of PERCINA is completed. We now therefore proceed to the next tribe, FISTULARINA, which we enter by reason of the affinity reigning between the *Chætodontidæ* and *Scombridæ*, as displayed in such genera as, for instance, *Brama* and *Coryphæna*.

Probable genera of the *Scombridæ*, or family *Scomberoides* of Cuvier.

Body regular and pisciform.

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|----------------------------|---|
| 1. CORYPHÆNA, <i>Linn.</i> | |
| 2. XIPHIAS, <i>Linn.</i> | |
| 3. SCOMBER, <i>Linn.</i> | Leading off by <i>Thyrmites</i> to <i>Lepidopus</i> . |

Body laterally compressed and vertically elevated.

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|-----------------------------|-------------------------|
| 4. STROMATEUS, <i>Linn.</i> | Ventrals inconspicuous. |
| 5. ZEUS, <i>Linn.</i> | Ventrals conspicuous. |

By *Lepidopus* we enter among the *Fistularidæ*, or long eel-shaped Acanthopterygians, which may be arranged as follows :—

TÆNOIDES, *Cuv.* One long dorsal. Cranium not produced into a tube. Body tolerably compressed.

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|-----------------------------|---|
| 1. LEPIDOPUS, <i>Gouan.</i> | Muzzle elongated; mouth considerably cleft, and a caudal fin present. |
| 2. CEPOLA, <i>Linn.</i> | Mouth considerably cleft; no caudal fin. |
| 3. GYMNETRUS, <i>Bl.</i> | Muzzle elongated, mouth small, caudal fin present. |

FISTULARIDES, *Cuv.* Cranium produced into a tube.

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|-----------------------------|---|
| 4. CENTRISCUS, <i>Linn.</i> | Body oval, compressed; scales conspicuous; dorsals two. |
| 5. FISTULARIA, <i>Linn.</i> | Body elongated, cylindrical; scales small; only one dorsal. |

By *Aulostomus* we return to *Lepidopus*, and by means of *Gymnetrus* and one of its subgenera, *Murænoides*, we pass to the *Gobioidæ*, a family easily known by the extreme length and tenacity of their dorsal

spines. The following are possibly the genera which generally have a tubercular appendage to the anus :—

Ventrals not thoracic.

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|------------------------------|--|
| 1. BLENNIUS, <i>Linn.</i> | Ventral subjugular, consisting of only two rays. One dorsal. |
| 2. ANARRHICAS, <i>Linn.</i> | Ventrals none. One dorsal. |
| 3. CALLIONYMUS, <i>Linn.</i> | Ventrals subjugular. Two dorsals. |

Ventrals thoracic, or placed further back than the pectorals.

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| 4. MUGIL, <i>Linn.</i> Mugiloides, <i>Cuv.</i> | Ventrals separate. Cæca numerous. Two dorsals. |
| 5. GOBIUS, <i>Linn.</i> | Ventrals united at base. Cæca none. Two dorsals, sometimes confluent into one. |

By means of *Callionymus*, *Eleotris* and *Chirus*, we pass to the *Lophiidae*, or Amphibious Acanthopterygians, of which the known genera may probably be as follows ; but the truth is, that I have never had an opportunity of accurately examining any of Cuvier's '*Labyrinthiform Pharyngeals*.' The following genera are chiefly to be ranked as families :—

LABYRINTHIFORM PHARYNGEALS, *Cuv.* Carpal bones not elongated.

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|-----------------------------|-------------------------|
| 1. * * * * * | |
| 2. ANABAS, <i>Cuv.</i> | Spines in the fins ? |
| 3. OPHICEPHALUS, <i>Bl.</i> | No spines in the fins ? |

PEDICLED PECTORALS, *Cuv.* Carpal bones elongated.

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|--------------------------|--------------|
| 4. BATRACHUS, <i>Bl.</i> | One dorsal. |
| 5. LOPHIUS, <i>Linn.</i> | Two dorsals. |

By means of *Ophicephalus* we pass to the *Labridæ*, or fleshy-lipped *Fistularina* that have no spines on their operculum or preoperculum. Their genera are probably as follows :—

Teeth concealed by the double lips, which are large and fleshy.

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| 1. LABRUS, <i>Linn.</i> | Muzzle not protractile. Body not laterally compressed. One dorsal. |
| 2. GOMPHOSUS, <i>Lac.</i> | Mouth protractile. One dorsal. |
| 3. XYRICHTHYS, <i>Cuv.</i> | Mouth not protractile. Body laterally compressed. Two dorsals. |

Teeth uncovered by the lips, which are single.

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|---|--------------------------------------|
| 4. ACANTHURUS, <i>Bl.</i> Theutyes, <i>Cuv.</i> | Spines arming some part of the body. |
| 5. SCARUS, <i>Linn.</i> | No spinous armature on the body. |

By means of *Xyrichtys* we return among the *Scombridæ*, and so complete the circle of *Fistularina*, which is therefore a natural tribe.

Let us now go back to the family *Gobioidæ*, and by means of *Gobius* we can easily make the transition from the tribe *Fistularina* to the Malacopterygian family *Cyclopteridæ*, which forms part of the tribe PLEURONECTINA, *i. e.* Malacopterygian fishes, which have never their ventral fins abdominal.

The families of *Pleuronectina* are probably as follow ; but they are rather *stirpes* than families :—

ABERRANT GROUP.

1. CYCLOPTERIDÆ. DISCOBOLI, *Cuv.* Ventrals united under throat.
2. ECHENEIDÆ. Ventrals separate.
3. ANGUILLIDÆ. APODES, *Linn.* Ventrals none.

NORMAL GROUP.

4. GADIDÆ. GADIDES, *Cuv.* Symmetrical body, with jugular ventrals far apart from anal fin.
5. PLEURONECTIDÆ. PLATESSA, *Cuv.* Body not symmetrical, having the ventrals generally a continuation of the anal.

Many genera of these families of *Pleuronectina* are wanting, so that I can only guess the above to be the natural series. *Brotula* and *Macrourus* certainly show the affinity of *Anguillidæ* to *Gadidæ*. The affinity of *Siluridæ* to *Anguillidæ* is well known, so that we next pass thus to the tribe CLUPEINA, which are Malacopterygian fishes with abdominal ventrals, *i. e.* the same as the group called ABDOMINALES by Cuvier. We are now more truly on the ground of your 'Monograph on Indian *Cyprinidæ*,' and I have little doubt of the following being really and truly the families or *stirpes* of the tribe CLUPEINA, viz. :—

ATHYLACENTERA. Intestinal canal not furnished with cæca.

1. SILURIDÆ. SILURIDES, *Cuv.* No true scales on body ; representing PLAGIOSTOMI.
2. CYPRINIDÆ. CYPRINOIDES, *Cuv.* Body scaly, mouth slightly cleft ; representing CYCLOSTOMI.
3. ESOCIDÆ. ESOCES, *Cuv.* Body scaly, mouth widely cleft ; representing LOPHOBRANCHII.

THYLACENTERA. Intestinal canal furnished with cæca.

4. CLUPEIDÆ. CLUPEÆ, *Cuv.* No second dorsal ; representing OSTINOPTERYGII.
5. SALMONIDÆ. SALMONIDES, *Cuv.* Second dorsal adipose ; representing STURIONES.

I am often afraid of trusting myself to Mr. Swainson's method of drawing analogies between things in themselves wide apart. A person may reasonably doubt the legitimacy of any comparison between a fish and an insect, or even between a fish and a bird ; because he may attribute all such resemblances to the imagination, the objects being in themselves so very dissimilar in every leading point of view. But no one can doubt that a fish may legitimately be compared with a fish, and every one will I think see that there is no effort of the imagination at work when a *Silurus* is compared with a *Chiloscyllium*, a *Cobites* with Cyclostomous fishes, or some of the mailed *Eso-cidæ* with the *Lophobranchii*. The *Clupeidæ* represent the *Ostinopterygii* typically in form, so that I have no doubt you will discover the analogy, as yet unknown to me, which exists between the *Salmonidæ* and *Sturiones*. I was ignorant of the true arrangement of *Cyprinidæ* until I read your valuable Monograph. I have now no

doubt of its being nearly as follows into genera, or rather into families :—

- VERÆ*, M'Clel. Body regular.
1. *PÆONOMINÆ*, M'Clel., or genus *CYPRINUS*, L. Intestinal canal long; representing *STURIONES*.
 2. *SARCOBORINÆ*, M'Clel., or genus *LEUCISCUS*, Kl. Intestinal canal short; representing *OSTINOPTERYGII*.
- APALOPTERINÆ*, M'Clel. Body invested with a slimy mucus.
3. *PÆCILIANÆ*, M'Clel., or genus *PÆCILIA*, Sch. Snout prolonged, no cirri. Branchial rays more than three; representing *LOPHOBRANCHII*.
 4. *COBITINÆ*. Mouth provided with cirri. Branchial rays three; representing *CYCLOSTOMI*.
 5. *PLATYCARINÆ*, M'Clel., or genus *PLATYCARA*, M'Clel. Head flattened, round and short. No cirri, branchial rays less than three; representing *PLAGIOSTOMI*.

Thus we see why the *Platyca* has the form of a shark; why Loaches, such as *Schistura*, M'Clel., have an analogy to the Lampreys and Myxines; why *Psilorhynchus* has so long a snout; and why *Gonorhynchus* has the muzzle of a sturgeon. The nearer two groups are in general structure, the more striking their parallel analogies will be; and therefore I think, that by comparing fish with fish, we may obtain more striking analogies than by comparing them, as Swainson does, with Mammalia, birds, or insects; at all events, we shall have less reason to distrust the effects of a fertile imagination. Still I am far from denying, that such analogies as he delights in exist in nature. I only say, that they are dangerous things to deal with, and that in his hands they often become far-fetched and even ludicrous. The cause of the greater part of the resemblances which he discovers between objects the most apart from each other in general structure, seems to be a general law of nature, which has ruled that in every group of animals there should be a minor group more essentially carnivorous, another minor group more essentially herbivorous, another more aquatic or natatorial, and so on. These minor groups may also be characterized by one being more essentially terrestrial, another more essentially aerial, another more aquatic, another more amphibious, and so on. These general principles are the occasion of resemblances between animals the most distinct in their structure, and therefore I understand perfectly what Swainson means when he speaks of a Rasorial type of fish; yet surely it is an incorrect expression, for so far from fishes having been created on the models of Rasores or Grallatores, for all that we know, birds may have been created on Plagiostomous or Cyclostomous types. The general model was undoubtedly one; but why Swainson should assume this one model to have been taken from birds I cannot divine, except that in ornithology he is most at home. However, to return to the subject of *Cyprinidæ*, your arrangement of them shows another set of analogies, which I also think very conspicuous; for instance,

- The *Pæonominæ* are the types of the family *Cyprinidæ*.
- The *Sarcoborinæ* represent the *Esocidæ*.
- The *Pæcilianæ* represent the *Clupeidæ*.
- The *Cobitinæ* represent the *Salmonidæ*.
- The *Platycarinæ* represent the *Siluridæ*.

You will perhaps say, that the *Cobitinae* ought to represent the *Siluridae*; but the relation between the *Cobitinae* and *Siluridae* is one of direct affinity, in which I perfectly agree with Swainson; and I have accordingly made the *Cyprinidae* and *Siluridae* contiguous groups in the table of CLUPEINA, given on a preceding page.

When I can secure a safe private hand, I shall beg your acceptance of a copy of the third part of the 'Illustrations of the Geology of South Africa.' In the mean time I must refer you to a copy which I gave our friend Dr. Cantor. In page 9 of that work you will see a Table which is in perfect accordance with your views of the value of the word *genus*; but not perhaps with your view of the word *family*; nor is what I have written above consistent with the view I have taken in that table of the value of the words *genus* and *family*. The truth is, what in the foregoing part of this letter are called Genera, are Families, and ought to end in *idae*, as the peculiar designation of that rank of group; but as these groups agree wonderfully with the extent of the old genera of Linnæus, I left them that name for your more clear comprehension of my meaning. To be consistent, however, with myself in the above-mentioned table (page 9 of the 'Illustrations'), the following ought to be the gradation of groups:

Regnum.—Animalia.

Subregnum.—Vertebrata.

Classis.—Pisces.

Ordo.—Ostinopterygii.

Tribus.—Clupeina.

Stirpes.—Cyprininae, above called 'Cyprinidae.'

Family.— { Cyprinidae, above called 'Pænominae,
or the genus Cyprinus.'

Genus.—Cyprinus.

Subgenus.—Tinca.

Section:—and so on to the species.

Your table therefore, given p. 261 of your Monograph, is more in harmony (except indeed the names, which are things of artifice, and have nothing to do with nature) with my table given in the 'Illustrations' than is the foregoing letter; and I wish you to understand, that were I to publish on Fish, I would make it clearly understood, that I view Linnæus's genera to be groups of the rank of families, so that the groups above called *Perca*, *Scomber*, &c., ought to be called *Percidae*, *Scombridae*, &c.

I have now written enough to show you how I imagine Fishes may be distributed into something like a natural arrangement. My views must of course be subject to a multitude of corrections; but I think they are more connected, that is, they show more unity, than any ichthyological synopsis which I have yet seen. I have worked out the *Plagiostomi* with particular care, as my friendship with Dr. Smith made me pay great attention to his unrivalled collection of Sharks and Skates. If you would wish to see the conclusions at which I have arrived with respect to the *Plagiostomi*, I shall be happy to send you a sketch in some future letter. In the mean time, you may make what use you please of what I have written in this letter, provided it

be clearly understood, that I am asking naturalists whether such be not the facts of the case, instead of dogmatically insisting upon it that they are. I have no idea of publishing on Fishes, at least for the present.

By the way, I observe that my old friend Colonel Sykes has been describing a number of Indian *Cyprinidæ* in the 'Proceedings of the Zoological Society.' Of course there must be "double emplois," which I hope you will rectify. I am sorry that I have not been able as yet to get any *Cyprinidæ* from our New Holland rivers; but I attribute it to my own residence so far from any river, not to the absence of them. I am promised by friends, who have better opportunities, the result of their researches; but *I receive nothing*, as they know not how to catch the minute fish of the river. However, I intend to try the Nepean river myself when I go down there, which I soon propose to do. In the mean time, my residence on the sea-side enables me to increase my collection of marine genera, and if there be any you wish for, I shall be most happy to send them. A thousand thanks for your kind method of *beating up* for insects to be sent me from India. I shall be happy to pay any fair price for the collector's time and trouble. Tell Dr. Cantor, that I depend on *him* to increase my collection of Annulose animals, and that I hope he will soon write me. Tell him also, that I have got a marine serpent of the genus *Pelamys*, caught in the mouth of Port Jackson harbour, the only one our fishermen have ever seen. If he wishes for it, it is at his service; for he knows infinitely more of Serpents than I do, and my grand desire is, to increase my collection of Annulose animals.

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But I could go on writing to you on these subjects *ad infinitum*, and therefore I trust you will excuse any tediousness on the score that my thoughts have been directed into this channel by the perusal of your Monograph. Pray remember me to Dr. Cantor, Dr. Griffith, Mr. Grant, and all who concern themselves with the works of nature, believing me always,

My dear Sir, your obliged and truly faithful,

W. S. MACLEAY.

October 12, 1840.

P.S.—As I have had no opportunity of forwarding the enclosed letter, I sit down to make some observations on it that occur to me on now reading it over some weeks after it has been written.

I know not whether you will clearly understand my meaning in making the *Cyclostomi* the most typical of fishes. Cuvier says that "the *Acanthopterygii* form the type most perfected by nature;" and in this I agree with him, namely, that their structure is most perfected; but the *Acanthopterygii* are not therefore the most typical of fishes, *i. e.* of a class, the general character of which is, to be the most imperfectly constructed of *Vertebrata*. Cuvier talks much of the *Acanthopterygii* being the most homogeneous in their variations; but are not the groups of Sharks and *Cyclostomi* quite as homogeneous? Nay, are not *Fistularia* and *Vomer* more distinct from each other in form than a Shark from a Skate, or a Lamprey from a Myxine?

There are some relations that require still to be expressed by my foregoing arrangement, such for instance as that of *Platycephalus* to *Eleotris*, as that of *Sphyræna* to certain *Esocidæ*, &c. &c. Are all

such merely relations of analogy? If so, they are expressed; but I cannot help thinking, that the relation is still stronger than that of mere representation.

All geological forms may I think be referred with ease to the foregoing arrangement, even the most anomalous in appearance, such as *Aphalaspis*; for this fossil form may, in my opinion, be understood by looking at the head of *Platycephalus*. However, the most extraordinary forms of fossil fish belong to the *Ganoids* of Agassiz, or rather to the *Sturiones*, and those other orders of the class Pisces that present the fewest existing forms. But on this head I shall at once frankly say, that if any fossil forms can be shown not to fall into a place in the preceding arrangement, then my general view of Ichthyological affinities is wrong; for I am convinced that there is but one system for all animals, whether Antediluvian or not. I shall write you on *Echinidæ* in my next, and send you some the very first opportunity.

XXV.—*Contributions to the Ichthyology of Australia.* By JOHN RICHARDSON, M.D., F.R.S., &c., Inspector of Hospitals, Haslar.

[Continued from p. 131.]

URANOSCOPIUS MACULATUS (*Forster*), Bearded Uranoscope.

Uranoscopus maculosus, Soland. Pisc. Austr. MSS. p. 21.

———— *maculatus*, G. Forst.; Fig. Nos. 176, 177, Banks, Libr.

———— *monopterygius*, Bl. Schn., p. 49, ex notis J. R. Forsteri, nomine specifico ejus mutato.

———— *cirrhosus*, Cuv. & Val. iii. p. 314. An. 1829.

———— *Forsteri*, Id. iii. p. 318.

———— *Kouripoua*, Less., Voy. &c. par M. Duperrey, 1830, pl. 18.

On Cook's first voyage a Uranoscope with a single dorsal was procured at Tolaga, in latitude $38\frac{1}{2}^{\circ}$, New Zealand, the colours of which were briefly described by Solander in his 'Pisces Australiae;' but as the details of structure were not given, and no figure was taken, it remained for future observers to furnish a proper character of the species. On the second voyage of our immortal navigator this Uranoscope was again obtained on the coast of New Zealand, at Queen Charlotte's Sound, in latitude 41° . The two pencil sketches above quoted were on this occasion made by George Forster, and in 1801 the species was described under the designation of *monopterygius* by Schneider in his posthumous edition of Bloch, from the manuscripts of J. R. Forster. The term *maculatus* is inscribed on G. Forster's sketches, and it is also noted that the native name of the fish is 'Bedee.' Just fifty years after Cook's second voyage, M. Lesson, one of the naturalists of La Coquille, commanded by Capt. Duperrey, discovered the same species, or one very nearly alike, in the Bay of Islands, where it bore the